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The Dzierzon Theory.

BY THE BARON OF BERLEPSCH.

No. VI.

We come now to consider that proposition which contains the most peculiar and characteristic feature of the Dzierzon theory; and which, when first announced, was rejected as incredible by intelligent apiarians, and regarded as preposterous and absurd by men eminent in the highest ranks of science.

9. All eggs germinated in the ovary of the queen tend to develop as males; and do develop as such, unless impregnated by the male sperm while passing the mouth of the seminal sac or spermatheca, when descending the oviduct. If they be thus impregnated in their downward passage, (which impregnation the queen can effect or omit at pleasure,) they develop as females.

From time immemorial naturalists have regarded as universally true, the doctrine that no living creature can be developed from the egg of a female, without male impregnation. And when occasionally exceptional cases were adduced, the men of science treated the statements with neglect or contempt, or endeavored to impugn their force or validity by assuming that the observers were either incompetent or careless. But when more recently it was asserted by observers, whose love of truth and skilfulness could not be questioned, that repeated instances had come under their notice where unimpregnated silk-worm eggs had produced larvæ which, passing through the usual metamorphoses, became moths, the necessity of re-investigating the subject could no longer be denied. At the same time, it was announced by other observers and naturalists, that they had witnessed the development of living creatures from unimpregnated eggs of various species of the lower order of animals. Thus, as it were, constrained to the task, the investigation was undertaken by men abundantly qualified by their attainments and skill to conduct it properly.

Though Prof. Leuckart had previously reported an instance of such development, the honor of first making an extended and thorough investigation undoubtedly belongs to Prof. Von Siebold, of Munich. He demonstrated clearly that not only do living larvæ occasionally issue from a portion of the unimpregnated eggs of the silk-worm, and develop as moths—some male, others female; but that in various species of butterflies (*Psyche helix*, *Selenobia triquitella*, and *S. lichenalla*,) the virgin females *regularly* lay eggs which, not partially only and occasionally, but uniformly and without exception, produce females.

Thus Prof. Von Siebold furnished the scientific proof that there are *exceptions* to this alleged universal law of nature; and that cases do occur in which unimpregnated eggs produce living creatures. Prof. Leuckart subsequently noticed a still greater number of exceptions, and says—"there can be no doubt that Parthenogenesis exists far more extensively among insects than is now known or anticipated."

This exception is found also among bees; with this difference however, that among them, *all* the eggs which remain unimpregnated develop as males, and those which are impregnated invariably develop as females, and that the impregnation of the egg determines its feminine sexuality. Consequently, in the case of bees, not only is every egg susceptible of development though unimpregnated, but masculinity *pre-exists* therein, which—marvellous, indeed!—is transformed into feminity by impregnation with the male sperm.

Nevertheless, this doctrine must not be understood as implying that every unimpregnated egg *must*, under all circumstances, become developed as a living male, for many of them may, from various causes, remain unhatched. Hence, if now and then, such an egg does not become developed, the failure is not more singular or striking than that occasionally an impregnated egg remains unhatched. Special causes may produce failure; but whenever an egg is hatched, it will, if unimpregnated, invariably develop as a male; or, if impregnated, it will as invariably develop as a female.

No analogous case has hitherto been observed in the entire range of animated nature, though from some experiments made by Prof. Leuckart, it is not improbable that hornets, wasps and humble bees come under the same category.

Dzierzon originally submitted this doctrine as a *hypothesis*, but did not take any special pains to establish its truth on scientific grounds, though numerous known phenomena in the life-history of the bee would have justified the effort. I advocated it the more strenuously and may claim credit for having been mainly instrumental in securing its final demonstration by Prof. Von Siebold.

I am anxious to attract the special attention of my readers to this portion of the theory, for it is the most important of all the propositions I have undertaken to discuss. With its aid, almost everything relating to bee culture becomes intelligible—without it, hardly anything is clear. He who does not fully comprehend this point will grope in the dark in all his practical operations, and be constantly exposed to mistake and disappointment.

A. To demonstrate this proposition, it is necessary to inquire whether there are any queens which have a spermatheca not filled with male semen, and being consequently unfecundated, yet lay eggs from which living creatures, invariably males, are developed. If this can be proven, the fact will be established that the eggs are by *preformation* masculine, and develop without the influence of male sperm. Such queens certainly do occur. I have myself discovered nearly a dozen. For brevity's sake, I will refer to only a few.

a. In the summer of 1854, the queen of an issuing second swarm, having crippled wings and being unable to fly, fell to the ground in front of her hive. As she was singularly large and beautiful, I concluded to use her for experiment. I returned her to the swarm, which I hived and placed in an isolated spot in my garden, at a distance from every other colony. In four weeks, this colony had drone-brood in worker-cells, which I permitted to come to maturity. I then transferred the queen with a portion of the bees to a glass observing-hive containing an empty comb, and watched till I saw the queen lay eggs. It was necessary that I should *see* this, in order to be sure that the male brood in the cells emanated from eggs laid by this queen, and not from such as were laid by a fertile worker. On dissecting her afterwards, I found her ovaries well supplied with eggs, but her spermatheca contained only a thin, pellucid liquid, without a trace of spermatozoa.

Mr. Vogel, likewise, reports five queens which laid eggs producing drones, and on examination the spermatheca of each was found to contain no male sperm. And, in 1856, Prof. Leuckart dissected a queen, which emerged from her cell with crippled wings and produced drones exclusively. He found no male sperm in her spermatheca.

b. About the middle of September, 1854, long after all the drones had disappeared, I removed the queen of a colony of common bees and let them rear one from a royal-cell transferred from an Italian colony. She made repeated excursions till the 20th of October, and on the 2d of March, 1855, the hive contained drone-brood in about 1500 worker-cells, and about 100 Italian drones had already emerged. I sent this queen living, with a parcel of workers and some drones developed from her eggs, to Prof. Leuckart for dissection. He reported that her spermatheca contained not a trace of spermatozoa, but was filled with a pellucid liquid, such as is found in those of all virgin queens. It may therefore no longer be denied than *an unfecundated queen can lay eggs which are hatchable, but which invariably produce males*—for the testes of the drones sent to Prof. Leuckart were found to have living spermatozoa in their sperm. Mr. Vogel reports the case of a queen, which an investigation by Prof. Leuckart proved to be precisely similar in all these respects.

B. On the 30th of June, 1857, Mr. Kehrhalm sent to Prof. Leuckart a queen which had been fecundated in July, 1854, and proved to be unusually prolific till in the autumn of 1856, laying hundreds of thousands of worker-eggs in that period. But in the spring of 1857 and until she was sent away, she laid drone-eggs exclusively. Prof. Leuckart made a microscopic examination of the contents of her spermatheca, and after the most careful search *could not find a single spermatozoa.*

C. I sent to Dr. Barth, three queens which laid drone-eggs exclusively. He examined them carefully, using the celebrated Leuchtenberg microscope at Eichstädt, but found no spermatheca in either. They must consequently have been *unsusceptible of fecundation.*

D. Eggs occasionally laid by fertile workers will hatch, but invariably develop as males. Workers are unsusceptible of fecundation, as has been demonstrated by Prof. Leuckart and also by Prof. Von Siebold.

E. If eggs required impregnation in order to develop as males, we should undoubtedly find a virgin queen occasionally, some of whose eggs would fail to hatch. But hitherto not a single case of this kind has been discovered, for whenever a virgin queen lays eggs, these, if kept in a brooding temperature, will hatch and develop as males. I concede that it is possible that a virgin queen *might* lay eggs which would not hatch; but I contend that no such case has yet been observed and recorded.

F. How does it happen that we never find a queen that lays *worker*-eggs exclusively? Why can every queen that lays worker-eggs, lay drone-eggs also? And why is it that so many queens are found that lay drone-eggs only? Simply because the eggs of the queen bee are male originally, and require impregnation for development as female.

G. It is an undoubted fact that a fecundated queen can lay a male or a female egg at pleasure. But how could this be explained, if the male egg required impregnation in like manner as the female? It has been alleged that the queen is not able to *determine* the sex of the egg, but only to *discriminate* the sexes when supplying drone or worker-cells—permitting the eggs to issue from one ovary or the other, according to the requirements of the case at the moment of ovipositing. This is manifestly false, for, how in such case could a queen which can only produce drones, lay drone-eggs in worker-cells, knowing, as she must on this supposition, that as male eggs these should be placed in drone-cells. Every colony desires first of all to have workers produced, and the queen intending compliance, designs to impregnate the eggs she lays, but is unable to effect it, either because her spermatheca contains no male semen, or because the spermatozoa therein have become effete, or because she has lost the power of exerting the requisite muscular action.

H. It is a fact that when the fertility of a queen begins to fail, she will lay more or less drone-eggs in worker-cells; and it also not seldom occurs with very prolific queens, that drones will be interspersed among the worker-brood. This, too, would be inexplicable except on the above ground; for the queen obviously designs laying not a drone, but a worker-egg. When the fertility of a queen is failing, she is no longer able to impregnate every egg, because her spermatheca is no longer adequately supplied with spermatozoa. Where a queen, in the full vigor of maturity, occasionally fails to impregnate an egg in the hurry of ovipositing, the egg simply passes the mouth of the spermatheca so rapidly that it does not receive any portion of the spermatozoa, or these are prevented from entering the micropyle of the egg. On the other hand, how does it happen that we *never* find a worker hatched or developed in a drone-cell? Would it not be marvellous that the queen's *mistakes* should all be on one side and tend in one direction?

I. If the male egg does not need impregnation, then pure Italian queens must invariably produce pure Italian drones, and pure common queens must as invariably produce pure common drones, *though each kind were fecundated by drones of the other race.* And such is the ascertained fact. I would, however, not strenuously urge the case of an Italian queen fecundated by a common drone, because we may easily be deceived here, mistaking for one of the pure race, a queen having really a taint of common blood. Common queens fecundated by Italian drones, furnish the clearest and most reliable evidence. Among the drones produced by twenty common queens, in my apiary, fecundated by Italian drones, and producing a more or less mixed worker progeny, there was not one bearing the slightest resemblance to an Italian drone—all being thoroughly of the common race.

K. In May, 1854, I caught and removed a fertile queen of the previous year, intending to use her in forming an artificial colony. When closing the slide of the queen-cage in which I confined her, her abdomen happened to be caught and violently compressed; and on releasing her, the hinder portion seemed paralyzed for some time. After the lapse of an hour, she appeared to have recovered, and I replaced her among the bees. She soon recommenced laying, and laid thousands of eggs with regularity in worker-cells, as she had previously done, but *every one of them produced a drone.* Probably the muscles connected with the mouth of the spermatheca had been injured; or, as Prof. Von Siebold surmised, the spermatheca itself had been ruptured or severed from the oviduct, thus disqualifying the queen for impregnating the eggs.

L. In the summer of 1854, it occurred to me that if the unimpregnated eggs of the queen invariably develop as males, then every queen that is able to lay *both kinds* of eggs, must cease to lay worker-eggs and lay drone-eggs only, if I could succeed in destroying the spermatozoa in her spermatheca without killing or otherwise injuring her. While endeavoring to devise some mode of effecting this, I read in Müller's "*Human Physiology*," vol. 2,

page 636, that a very high or a very low temperature would destroy the vitality of spermatozoa. I conceived that as heat was the genial element of bees, exposing the queen to a low temperature, yet not so low as to kill her, would effect what I desired to accomplish. Accordingly, in July, 1854, I confined three very fertile queens separately in queen-cages, placed them in an ice-house, and let them remain there thirty-six hours. They were thoroughly chilled—stiff with cold, and white with frost. I removed them, placing them in the rays of the rising sun. They all remained motionless a long time, but at about seven o'clock one of them began to move her limbs slightly. I presented some honey to her proboscis, and in ten or twelve minutes she was completely revived. The other two were irrecoverably dead. I restored the revived queen to her hive, and she afterwards laid thousands of eggs in worker-cells, but all of them, without exception, produced drones. After dissecting her for examination, it was found that the contents of the spermatheca were of a yellowish hue and more liquid than usual. Obviously the spermatozoa had been killed by the cold and were decomposed; and the queen could therefore no longer impregnate the eggs. Dzierzon also records three instances, where queens which had been chilled by exposure to cold, laid drone-eggs only after reviving, though each had previously laid both worker and drone-eggs. A fifth case occurred in the apiary of Mr. Liebe, who sent the queen to Dr. Küchenmeister for microscopic examination. The spermatozoa were found to be motionless and dead.

From these various observations, experiments and facts, I deduce the following conclusion: As it is certain each egg must be impregnated by spermatozoa from the queen's spermatheca, and it is likewise certain, *in the first place*, that queens and fertile workers occur, which though either having no spermatheca or such as contains no spermatozoa, yet lay eggs invariably producing drones only; *secondly*, since queens by compression, exposure to cold, or from other causes, lose the capacity to lay worker-eggs and lay drone-eggs exclusively; *thirdly*, as no queen has yet been found producing eggs which failed to hatch when brooded in a suitable temperature: *fourthly*, as every queen which can produce workers can likewise produce drones, though not a few produce drones exclusively; *fifthly*, since the capacity of normally fertile queens to produce workers or drones at their own option, can only be explained or accounted for on the assumption that the male eggs remain unimpregnated; *sixthly*, since many queens produce drones when obviously designing to produce workers; and *seventhly*, since common queens fecundated by Italian drones produce mixed or hybrid workers indeed, but pure common drones exclusively—it necessarily follows that *all the eggs in the ovaries of the queen are originally and naturally male, and develop as males when laid without having been impregnated; but are changed to female, if impregnated before being laid.*

Such is substantially the position I had reached in 1855. Still the demonstrative scientific proof of its correctness was wanting. It was yet necessary that we should ascertain, by means of the microscope, *first*, whether all the eggs laid by the queen are alike in shape or form, and especially whether the eggs producing the several sexes were all furnished with the micropyle apparatus; and *secondly*, whether spermatozoa are found on the micropyle or in the interior of recently laid female eggs, and are wanting on or in male eggs. Providentially, two of the most competent and skilful living naturalists, Prof. C. T. Von Siebold, of Munich, and Prof. R. Leuckart, of Giessen, took a lively interest in my investigations. Both visited me at Seebach, and used their microscopes for a minute examination of the material which my apiaries placed at their disposal.

Prof. Leuckart, who was the first to visit me, was only able to determine that the male as well as the female eggs were furnished with the micropyle apparatus, and were precisely alike in shape or form; but he did not conclusively ascertain the second point of the inquiry, for he succeeded only in detecting spermatozoa on the micropyle of two worker-eggs. Having restricted himself to searching for spermatozoa only on the *exterior* of the eggs, he failed to obtain any decisive result. In the case of bee's eggs, the spermatozoa are not constrained, like those of other insects generally, to force a passage through a dense albuminous stratum before reaching the chorion; but are deposited almost directly on the micropyle apparatus, and can enter the micropyle with little delay or difficulty.

Prof. Von Siebold, who honored me with a visit in August, 1855, was more fortunate. He was able not only to substantiate Prof. Leuckart's observations, but to demonstrate the presence of spermatozoa in female eggs and their absence in male eggs—thus solving this interesting problem scientifically, and forever settling the question.

Prof. Von Siebold was mainly indebted for his success to a novel mode of preparing the eggs for examination, which occurred to him after numerous failures in his efforts to prepare them in the ordinary manner. He crushed them slowly and gently by means of a thin plate of glass, in such a

manner as to rupture them at the lower end or pole, opposite to that on which the micropyle is situated, thus causing the yolk to issue below, leaving a transparent vacant space above, between the chorion and the receding yolk. He directed his attention specially to this vacant space which he thus saw gradually forming under his microscope, as the yolk of the egg was passing out of the ruptured envelopes; and in each of thirty, out of forty, of his prepared female eggs, he found from one to five spermatozoa. In three of these eggs the spermatozoa were still active. On the other hand, on examining twenty-four successfully prepared male eggs, he could not discover a single spermatozoa either on their exterior or in their interior. So late in the season we could not procure a larger number of drone-eggs; but those used were of the same age with a portion of the worker-eggs, and were laid by the same queen. Prof. Von Siebold, in his treatise on "*Parthenogenesis in Bees and Butterflies*," gives a detailed report of this discovery, so startling to all physiologists and so subversive of the hitherto received doctrine of animal re-production.

Prof. Leuckart subsequently investigated the matter anew, and fully corroborated Prof. Von Siebold's observations, having frequently discovered spermatozoa in female eggs, but never found any in male eggs.

At the close of this important article, I will merely add that if unimpregnated eggs did not develop as males, and impregnated ones as females, "*the entire complicated economy of the commonwealth of bees, as arranged and ordained by the Creator, could not permanently subsist.*" Such is the expressive declaration of Prof. Von Siebold, on reviewing the case in all its connections and bearings.

☞The only reliable means of preventing the absconding of a swarm, besides the forming of artificial colonies, is found in drumming out the first and the second swarms at the proper period. To prevent a natural swarm from decamping after being hived, place it in a cool room or a dry cellar for twenty-four hours, supplying it plentifully with honey. The bees will commence building comb, and their swarming fever being cooled off, they will remain contented, when afterwards brought out and placed on their stand. Second swarms may be prevented, by destroying all the royal cells, if they are accessible, as they are in movable frame hives. If after a swarm is hived, the bees are heard nibbling at the inner surface of the top, we may safely conclude that they intend to make their new domicile their permanent abode.

[For the "Bee Journal."]

In answer to an inquiry on page 77 of the "Bee Journal," you say, "The dysentery and consequent mortality, in the above case, were probably caused by the want of sufficient *upward ventilation* in the hives used." I am inclined to think that we shall have to look a little farther in our investigations for the true cause. I wintered my Bees in a very dry cellar. About half of them being in the movable comb hives, I removed the honey board entirely, the others being in box hives with from two to four holes in the top; all the hives being raised a little from the bottom. The result was, all except two proved very unhealthy; so much so that I lost seven swarms out of twenty-six. The two healthy swarms were in box hives with two 1¼ inch holes in the top. All the swarms which died were in the frames. The bees in the frame hives discharged their fæces mostly on the top of the frames and upper edges of the combs, those in the box hives came out of the holes in the top and emptied themselves around the holes, and their combs appear cleaner than those in the frames. Now, instead of thinking ventilation or no ventilation the cause of this difference in healthiness, I am inclined to go farther back, and see if the true cause may not be in the honey which they feed on. I shall not be able to answer this question myself; but I wish to institute inquiry, and to this end will make the following suggestions. *First*, two successive dry seasons, (that is here) and an almost entire failure of flowers to yield honey. *Second*, bees did not seal their honey for many weeks after it was stored. This second suggestion is worthy of attention; in a wet season, when we might suppose bees would get more or less water with their honey, it would not appear to be so strange, that they should leave it unsealed for the water to evaporate. Probably the most of the honey obtained *here* after white clover failed, was from wild flowers. Although I sowed five acres of buckwheat early and it was in blossom a long time, I could not at any time find only a few cells of buckwheat honey. So scanty was the honey harvest, that of nearly fifty new swarms in my neighborhood I do not know of one that has wintered.

As a farther help towards a solution of the second query, if beekeepers who have large hives that might have contained old honey, would communicate their observations on this point, through the "Bee Journal," we might perhaps, after a while, arrive at some definite conclusion. J. F. L.

Marengo, Ill.

☞Please send us the names of beekeepers.

BEE ITEMS FROM MAINE.

Ed. Am. Bee Journal:—It was amusing to read the notices of the "Bee Journal" when it was first started. Some papers, though speaking very highly of it, thought that it would take but a few numbers to contain all that is known or that is necessary to know about bees for their successful keeping, and then its mission would be accomplished.

Without doubt you and the publishers will be content, if it can have a generous support till then, to stop it with a spicy valedictory when this knowledge shall be possessed by the masses; but, till then, there seems to be an extensive field unoccupied by any other journal among us, which ought to have a possessor,

The past winter—1860–61—has been one of the severest for bee culturists known for a long series of years. Stocks, with ample stores, have died in-doors and out-doors, with, as far as I can judge, but little difference.

Many who have been among the "lucky ones" for years, with bees, have been as heavy losers as any, and yet can not, only by guessing, tell the cause of such loss among bees as has been this past winter.

Here, in lat. 44° 46′ N., altitude 560 feet, saw the drone bee first out, only a few, May 5th, and at that time, not very warm, but pleasant. None of the Italian bees in this section of the State, as yet, that I am aware of, and as there are no extensive apiarians, doubtful if any are introduced this season, at the present advertised prices.

On page 112, Bee Journal, it is stated that bees will gather honey from different flowers on the same excursion, promiscuously, but when collecting pollen confine themselves to one species of plants or flowers.

The *American Bee Keeper's Manual*, p. 81, says they collect honey from one specie at a time *only;* that is, a division collects from one kind of tree blossoms and another division collects from another, and so on, without ever changing from one species to another, or from tree blossoms to any other flower on the same excursion.

How is this? O. W. True.

Elm Tree Farm.

☞A drone-breeding colony is generally very unwilling to accept even a fertile queen when introduced in the hive, and speedily destroys a sealed royal cell if inserted. Mr. Kaden says this perverseness and obstinacy may easily be overcome, if the sealed drone-brood be destroyed, by passing a sharp knife through it; a fertile queen then offered will be kindly received.

GREAT YIELD OF HONEY.

Mr. Hamilton writes thus to the "*Sacramento Union*," from Stockton, under date of January 14th, 1861:

"Thirty-five swarms of bees did produce, during the past season, over twenty thousand pounds of honey. I am not surprised that the truth of this should be questioned, for I doubt if the world can furnish a parallel. Not that a hive producing 571 pounds, in one season, cannot be found; but that thirty-five swarms should average that amount is a great yield. But it is of no good to the public to be told that a great thing was done, unless they are informed how it was done. This I will try to do in as few words as possible.

"About the 1st of February, 1860, I left Stockton with thirty-five swarms of bees—25 swarms in Langstroth's hives, containing about 1400 cubic inches—and 10 swarms in another movable comb hive, containing about 2000 cubic inches each. I took these bees to the town of Santa Clara, Santa Clara County, and kept them there until the 1st of July, six months. I managed them on the system taught by the Rev. L. L. Langstroth, in his work on the honey bee. I fed them on nothing except the honey that I took from them. By the 1st of July the swarms had increased to 270. I removed them at that time to the vicinity of Stockton, whence they started; and by the 1st of October the swarms had increased to 500. The large hives, 10 in number, have increased to 75; containing 60 pounds of honey each, or 4500 pounds. The small hives, 25 in number, have amounted to 425, containing about 35 pounds each, or 14,875 pounds. From the small hives, in September, about 700 pounds were taken, and they afterwards filled 700 pounds; making for the whole the great total of 20,075 pounds. From the above it will be seen that the small hives have been much the most profitable. Bees do very little in Santa Clara, after the 1st of July; but in San Joaquin and Sacramento Valleys, they do the most after the 1st of July,—July, August, September and October being the best months of the year."

☞Prof. Leuckart has recently expressed the opinion that, for the production of wax, pollen is of rather more significance than honey. The latter, or its equivalent, is of course always indispensable, and the former may at times, for a brief space be dispensed with. But for the rapid and abundant production of wax both are required, and the Professor thinks that then pollen is much more extensively used in the process than is generally supposed.

☞Please send us the names of beekeepers.

Hermaphrodite Bees.

We translate from the Bienenzeitung, Dr. Dönhoff's account of the hermaphrodite bees, to which reference was made in our last number.

"On the 6th of July I received a bee, with the following note accompanying it:

'I send you herewith a bee, which I regard as half drone and half worker. The head appears to be exactly like that of a worker, and the abdomen like that of a drone. I take it to be a *monster*. But how does this apparent combination of the sexes correspond with the theory of fecundation? If the creature is what it appears to be, it may possess some interest in a scientific aspect, though of no account in practical bee culture.

Ohlau, July 3d, 1860. WALTER.'

I have examined this singular specimen very minutely, and the following is the result of my observations:

1. The head and the thorax with its appurtenant organs, differ in no respect, whether in size, shape, color or hirsuties, from those of a worker bee, and have no resemblance to those of a drone. On a most careful comparison with a worker, I could not detect the slightest difference in the parts referred to. In shape, the compound eyes are precisely like those of the worker, having on the forehead an intervening space decorated with a tuft of hair; and containing the three simple eyes, which in the drone are situated more fully in front and just below the junction of the compound eyes on the forehead. The proboscis has the length of that of the worker. The hinder legs have the corbicula characteristic of the worker. The *tibia* and tarsus are fringed with a seam of hair, which is wanting in the drone.

2. The abdomen has exactly the appearance of that of a small drone. It is somewhat larger, broader, and more obtusely terminated than that of a worker. The first two dorsal segments are slightly hirsute; the last two have the hairy tufts characteristic of the drone; and the lower margin of each segment has the characteristic sharply-defined brighter edging. The ventral segments are more hirsute, and the edging is broader than in the workers, and precisely similar to what we see in drones. The rear abdominal ring terminates in an obtuse brown point, characteristic of the drone. The wax-secreting membranes, characteristic of the worker were entirely wanting, and instead thereof, the upper section of the abdominal rings has a black margin.

I dissected the abdomen with the utmost care. The sting and its appendages were wholly wanting —being replaced by the male sexual organs. I may add, for the benefit of doubters, that the thorax and abdomen were united organically, just as those parts are united in common bees; and that artistic skill could not have effected such a junction for the purpose of deception. Unquestionably I had before me a most remarkable creature, *the anterior portion of its body being that of a worker, and the posterior portion that of a drone.*

There are two ways in which this singular combination of the sexes may be explained:

1. It is possible that the egg which produced this creature contained two yolks, one of which was impregnated by drone semen, and the other not. In the yolk of the latter a drone, and in that of the former a worker, was developed. These gradually coalesced, and were finally blended into one.

2. According to the Dzierzon theory of the origin of drones from unimpregnated eggs, the process of development in this particular case may be more easily explained. The egg contains the male individual *in potentia*, and the spermatozoid the female *in potentia*. The development of all animals depends on the intimate union of the germ of the egg with the germ of the spermatozoid. In the development of the worker, the spermatozoidal germ predominates; hence, in consequence of fecundation the female is developed. In the case under consideration both were developed, yet so imperfectly that the germ of the spermatozoid produced the head and thorax, while the germ of the egg produced the abdomen.

But, let the development have been caused or determined as it may, this discovery is one of the most interesting ever made in pathological anatomy or in bee culture. It is, in fact, the most singular instance of animal monstrosity that has come to my knowledge. It would have been additionally satisfactory to know what were the instincts or propensities of this bee while living —whether it was prone to gather honey and pollen, or whether like drones it was a mere consumer and left its hive only during the warmer hours of the day."—*Orsoy, July 7.*

"Yesterday there was sent to me another such bee, with the following note:

'Judging from the tenor of your article in the Bienenzeitung, No. 15, 1860, it would seem that such abnormal creatures as there described are thought to be of rare occurrence among bees. It is, however, by no means so. I venture to say that if all beekeepers were careful observers, some similar specimens would be discovered yearly in any extensive apiary. They are usually found

dead in front of the hives, just before the close of the swarming season—perhaps because more attention is then paid to the bees, or possibly because the queens have then reached a particular stage in egg-laying, when only such vagueness in the propagation of the sexes can occur.'

'The instances of amalgamation which I have most frequently noticed, and which it would seem nature can most easily produce or permit, are like that which you have described. Nevertheless, specimens are sometimes found which might lead one to imagine that nature was totally at fault in their origination, since it is impossible to determine with precision where the worker begins or the drone ends in them. In the one I send you, you will find this remarkably exemplified. I leave it for you to furnish a particular description of the creature, should you deem it of sufficient importance to engage your attention. Meanwhile I consider it a duty to communicate the circumstances under which I discovered it, and what I observed while it was still living.'

'On the 11th of August, I drummed out a drone-breeding colony, the remains of an old stock from which a swarm had been previously forced. There were only about 300 bees remaining, and while examining these in the hope of detecting the drone-mother or unfecundated queen, I noticed a small drone exhibiting singular movements and unusual agility. I caught it, and on close inspection of its ventral side, I fancied for a moment that I had got hold of the wrong insect, as what I held in my hand seemed to be a regularly formed worker. But a second glance convinced me that I had possession of an abnormal creature, manifestly worker on its ventral and drone on its dorsal side. On repeatedly returning it to its companions, it exhibited the same actions and joyful fanning which workers display in such case. Her companions manifested no special interest in her, and bees of other colonies treated her with indifference.'

'Her sting produced the same effect as that of other bees; but unfortunately it remained fixed in my skin. It seemed to be rather smaller than bee's stings usually are. You will find it inserted, point foremost, between the last two abdominal rings. That the circumstances here stated and the observations made, are correctly detailed, and that the accompanying sting was organically connected with this drone-worker, can easily, if required, be established by satisfactory testimony.

Polchow, near Stettin. WITTENHAGEN.'
August 14, 1860.

"To this highly interesting communication, I subjoin a description of the bee, premising that for more accurate comparison, I placed the hermaphrodite between a worker and a drone on my table.

1. The head differs in no respect from that of a drone. The antennæ do not form a straight line, like those of a drone, but are curved outward; and the joints are clearly defined and prominent. The compound eyes are large and meet above like those of the drone; the simple eyes are placed in the front, on the brow or face; and the proboscis is short.

2. The thorax differs in nothing from the thorax of a worker. The legs are shaped like those of a worker, and the hinder two are provided with corbicula.

3. The abdomen has the characteristics of worker and drone blended. The dorsal segments have the hirsuties and colored margents of the drone. The ventral segments resemble those of the worker. Between several of the rings, thick scales of wax were found. The anal orifice is situated at the rear termination of the longitudinal axis of the body. The brown point of the last abdominal ring, as seen in drones, was wanting. As I design preserving this insect, I did not dissect it. From the presence of the waxen scales, sting, &c., we may infer the absence of male sexual organs. What is remarkable in this creature is that the head is the head of a drone, and its instincts (judging from its *fanning*) were those of a worker. This also suggests two conjectures—either the source of the instincts or impulses is not seated in the brain, or the head is only externally the head of a drone, while internally the brain is that of a worker!

I requested Mr. Walter to give me an account of his discovery of the hermaphrodite which he sent for examination. He writes as follows:—

'I found it between 8 and 9 o'clock in the morning, crawling about on the grass in front of my apiary. It had obviously just emerged from its cell, and had either voluntarily left its hive, or been expelled as a useless member of the community. Desiring to preserve it alive, I offered it honey; but it refused to eat, and seemed intent only on running about incessantly. I could not ascertain from which colony it issued, as my hives were then ranged pretty close to each other.'

Whether this bee was consciously diseased, or whether it was expelled from the hive, cannot now be known. The one found by Mr. Wittenhagen was in health and in the full exercise of vital functions, as is evident from the secretion of wax and from the *fanning* in which it engaged—which are of themselves indications that it might have attained the usual age of a worker.

Orsoy, Aug. 21, 1860. DÖNHOFF."

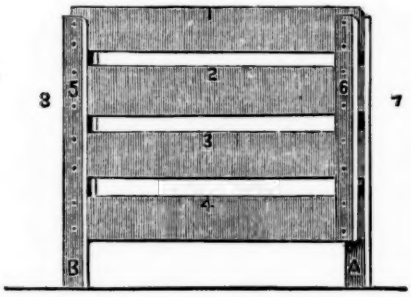
(For the "Bee Journal.")

Improved Colvin Guide Frames.

To avail ourselves fully of the movable comb principle, the bees must be compelled to build all their combs not only straight, but of uniform thickness. Every comb will then fit, without trimming, any where in any hive. For more than ten years I have kept this point steadily in view, and after numerous experiments, have become satisfied that bees, if left to themselves, will never construct their combs in the way desired. Even if they make them of uniform thickness, they will wave them more or less to give them greater strength, just as iron is corrugated for the same purpose.

I shall now give a description of a device which I invented some months after Mr. Colvin's, and which, if he should patent his invention, can only be used with his permission. My guides were tried last year with considerable success; and the mode of making them was so improved by the Rev. L. Wheaton, of North Falmouth, (Mass.) that he met with uniform success. I have still further improved and simplified their construction, retaining Mr. Colvin's original principle, but adding to it two very important features, viz: that these guide frames regulate the distance between the comb-frames, and hold them firmly together and "out of wind."

The annexed is a perspective view of one of these guides, and the dimensions are intended to suit the size of hive and comb-frames given in the third edition of my work on the Hive and Honey Bee.*



1, 2, 3, and 4 are slats, each 17⅞ inches long, by 1⅜ inches wide, and ⅛ inch thick. 5 and 7 are each 9¼ inches long, by 1⅜ inches wide, and ⅛ inch thick. 6 and 8 are each 7⅞ inches long, by ½ inch wide and ¼ inch thick. In nailing, the slats are put between 5 and 7, and 6 and 8, the bottom slat coming flush with the lower ends of 6 and 8, and the top slat projecting ⅜ inch above the top ends of the uprights 5, 7 and 6, 8. The spaces between the slats are each ⅜ inch wide.

Thin nails (cigar-box nails are best) ⅞ inch long, are driven as shown in the cut, so as to fasten the slats between the uprights, and slightly clinched by nailing upon an iron surface. The lower ends of 5 and 7 (A and B) extend below the ends of 6 and 8, and form legs which rest on the bottom board of the hive. These legs are on opposite sides of the guide-frame, so as not to interfere with the bradding of the comb-frames as described in the last No. of the Bee Journal.†

Mode of using them: Put the first comb-frame ¼ inch from the farther side of the hive, crowding a wad of paper or cotton between the top of the frame—where it rests on the rabbett—and the side of the hive to keep the frame in place. Now put in, as close as possible, a guide frame; then another comb-frame, &c., until the hive has nine comb and nine guide frames. The last guide-frame may be slightly bradded to the last comb-frame, so that the two can be lifted out together. It will be well to put one frame with brood into the hive (see page 115 of my work), before hiving a swarm, as the bees are more liable to desert such a hive, not knowing that their owner intends to remove the partitions between their combs. The mode of removing the guides is the same as that described in the April No. of the Bee Journal.

It may be asked—Can we interfere so much with the bees, and yet not diminish the amount of comb built or honey gathered? This question can be more satisfactorily answered, after the guides have been tried, by many observers, under the varying circumstances of different seasons and locations. Enough, however, has been done to make complete success highly probable; and if the final result justifies our expectations, the Improved Colvin Guide Frames will be second in importance only to the movable comb principle.

L. L. Langstroth.

Oxford, Ohio.

*In some copies of that edition the top of the frames is given 1⅛ inch wide. It ought to be one inch.

†In that description, as well as this, the hive is supposed to be placed before the reader, with the portico on his left hand and the leg B of the guide comb on his left hand also. Nine guide-frames form a set, and where a number are made with proper facilities, a set need not cost over 25 cents, and can be used year after year.

☞If not prevented by change of weather or other cause, the first hymeneal excursion of a young queen will be made on the same day on which the swarm is hived. But ordinarily it takes place on the following day, between noon and 3 P. M., rarely later, and still more rarely in the forenoon.

[From the "Bienenzeitung."]

Change of Queens.

That bees not unfrequently change their queens, deposing and expelling or destroying the old ones and rearing young ones in their stead, will hardly be questioned by any experienced apiarian. Colonies, subsisting twenty or even thirty years in a flourishing condition, are indeed occasionally met with; but certainly no queen could survive during so long a period, and continue vigorous and prolific all the time. Careful observation has established the fact that bees are short-lived creatures; and where a stock is maintained during a succession of years, repeated changes of queens must obviously take place. Such changes appear, however, to occur much more frequently, or at shorter intervals among Italian bees than among the common kind. I will relate my last summer's experience.

I wintered thirty-six colonies in 1859–60. About the half of these, to my certain knowledge, contained one and two year old queens; and the queen of one colony was a drone-egg layer, reared late in November. All of them passed the winter safely; but in March some began to discard their queens, and the destruction was not restricted to the older, but extended indiscriminately to the one and two year olds also. This game was repeated in April, May and June, and involved the loss of twelve queens. Three or four colonies perished in consequence, and among them the one having the drone-egg laying queen. One queen died from superannuation and exhaustion. Thus one-third of my stocks were so weakened and reduced, as to be unable to avail themselves properly of the spring and summer pasturage—failing not only to furnish any surplus stores, but some of them actually requiring to be fed in autumn. If fall pasturage had been abundant the case would doubtless, in this respect, have been different; but in my neighborhood there is usually little to be gathered after the rye-harvest, and the continual wet weather last spring and summer interfered greatly with the earlier supplies. This frequent changing of queens, which Dzierzon regards with favor, is consequently a trait in the Italian bees which does not specially recommend them to me, in my locality, however advantageous it may, on many accounts be, in districts where late summer and fall pasturage abounds, and the apiarian has numerous colonies, and like Dzierzon has on hand a constant supply of reserve queens, in nuclei and small hives, ready for emergencies as they arise.

Nevertheless, I shall continue to cultivate this beautiful, industrious, and good-tempered race, ever striving to maintain it in its purity, difficult as it is to accomplish that in a place where common drones still abound. Yet, according to my experience, success is attainable even there—especially if queens be reared in the latter part of summer and early in the fall, when common drones have very generally disappeared. If proper means be taken to preserve Italian drones till such period, little difficulty will be encountered. Late in the season, queens will not fly so far from their hives, when making their hymeneal excursions, as they do in the warm days of summer; and are consequently more certain of meeting with drones pertaining to their own apiary. O. Rothe.

Allschau, Nov. 21, 1860.

YOUNG QUEENS.

The proceedings of a young queen are singular. After leaving her royal cell, the first effort of a newly hatched queen is, by *teeting* or *piping*, to incite the workers to destroy all the embryo rivals which other royal cells may contain. Not till this is accomplished does she make her hymeneal excursions. But if the weather is remarkably fine, pasturage abundant, and much vacant room in the hive, it occasionally occurs that the zeal for honey-gathering overpowers the swarming propensity of the workers, and some of the embryo queens are permitted to mature. The first emerged queen will then fly out to meet the drones, and drone brood will be carefully fostered. Such cases, however, are rare—though they serve to establish the rule that young queens will not make their excursions till all rivals are disposed of. The same thing takes place, if a virgin queen confined to a cage be suspended in a hive containing one just emerged from her cell. The latter will not leave the hive, though at liberty to do so, till her fancied rival is removed. A different result sometimes occurs when a strong second swarm, which happens to be accompanied by two queens, is placed in a large oblong hive. Here the swarm may divide into two parts, each retaining a queen, and the one take up its abode in the front, and the other in the rear part of the hive. Each of these queens, thus situated, will issue, and if fecundated, commence laying. The singularity in such case is that the queen and workers of each portion will make peaceable use of one common entrance.

☞Young queens do not usually make their hymeneal excursions till the eighth day after leaving their cells; sometimes, though seldom, on the fifth day; and early in the spring commonly not till the tenth or twelfth day. Very small queens, or such as were bred in unusually small cells, are still more dilatory.

Dysentery.

Dysentery in bees is a profuse involuntary discharge of fæcal matter, within the hive, resulting from inability to retain the accumulations in the intestines and rectum for a prolonged period, when confined by stress of weather in the winter and spring. It is not in itself a disease, arising from inflammation of the mucous membrane of the intestines; for if relieved by a seasonable change of weather, which enables the bees to fly and void their excrement, all unfavorable symptoms at once disappear, and the colony remains healthy. But continued confinement after the involuntary discharges have taken place, and prolonged exposure to the foul air thus generated, debilitate the bees and cause the mortality which so rapidly depopulates the hive.

The length of time during which bees can bear confinement without inconvenience, depends greatly on circumstances. They may endure it for ten or twelve weeks wholly uninjured, or they may be ruinously affected, if shut in only a few days—according to the nature of their food and amount consumed, the dry or damp state of the air they respire, or the degree of cold to which they are exposed. When they have access to pure uncandied honey, breathe an uncontaminated air, and are kept quiet in a uniform moderate temperature, the consumption of food and consequent accumulation of excrement will be small, and prolonged confinement will not incommode them. But when the honey they consume in the winter is thin and watery, or was gathered from evergreens, late honeydews, or exclusively from heath flowers, and has remained unsealed in the cells, the consumption will be inordinately greater, the accumulation of excrement more rapid, and its retention more difficult. So also, where the colony is subjected to frequent disturbance, rousing and exciting the bees; or where the changes of temperature are frequent and great, or the general temperature in which they are kept is very high or very low, similar consequences ensue—especially if there be a superabundance of moisture in the hive. So far as it is in his power, the apiarian should guard against these conditions.

Exposure to cold and hunger will be followed by dysentery; and if immediately after gorging themselves with honey, bees be placed in a temperature of from 50° to 55°, they will certainly be subject to dysentery within twenty-four hours. It is difficult to say whether this results from an affection of the intestinal canal, or whether the instinct of the bees has simply been put at fault, permitting involuntary evacuations. Dysentery rarely occurs except in feeble colonies and hives affording slight protection from cold—partially, perhaps, from the greater quantity of honey consumed, for the purpose of generating animal heat. While this object is imperfectly attained, rapid digestion overloads the intestines with fæcal matter, and causes a general relaxation of the system.

It has been supposed that from atmospheric causes dysentery sometimes assumes an epidemic character, affecting the apiaries in a wide range of country. Such was the case in Lusatia in 1840, when more than three-fifths of all the colonies there were destroyed. Dr Jähne thought the consumption of unsealed honey gathered, late in the fall, from the heath flowers (*Erica vulgaries*), was the originating cause. Ehrenfels records the destruction of an entire apiary, consisting of more than 300 colonies, by dysentery, resulting from the consumption of an unsealed viscid honey gathered from pine and fir trees. This contained only a small proportion of saccharine matter in a large mass of crude and indigestible substance. It was tough, clammy, and resinous, and could be drawn out in long threads. Two years ago Dzierzon lost a considerable number of bees, in colonies which had stored up this description of honey. Late gathered honey-dew is injurious, for similar reasons. It contains comparatively little nutriment, generally remains unsealed in the cells, undergoes partial fermentation, and becomes acid. It produces no injury if consumed when the bees can fly freely, because they are then able to evacuate their excrement; but confinement while they are restricted to such diet, proves disastrous.

The disease called *May sickness*, is not dysentery, but constipation; though it also results, in some cases, from the consumption of bad honey. Fæcal matter accumulates in the intestines and rectum, accompanied by an inability to evacuate, resulting from the sluggish condition of the viscera. Brooding bees appear to be particularly liable to this disease. We find them leaving their hives and crawling about on the ground, unable to fly, and with the abdomen inordinately distended. It rarely happens that any considerable number are thus affected at one time, though some are found every season, in colonies which are populous and have much brood. It is thought to be caused among the brooding bees, or nurses, by excessive consumption of honey and pollen, and prolonged though voluntary confinement.

Various remedies for dysentery have been proposed, but none of the medicaments recommended seem calculated to be of service. If the excrement of bees suffering from this malady be chemically analyzed it will be found precisely similar in com-

position to that of healthy bees, though rather more liquid. Feeding with buckwheat honey, which has been largely relied on as a cure, can scarcely have any other effect than that of inciting the bees to fly, as does similar feeding with diluted honey or sugar-water. If the weather permits them to follow the impulse, and thus affords them an opportunity to void their excrement seasonably, the affection disappears—or, as it is termed, the disease is *cured.*

On the whole, it would seem that the *avoidance of extremes* is the most effectual mode of guarding against the malady. Too much or too little food, too much or too little heat, too much or too little moisture, and too much confinement, are all alike injurious. In this, as in most other things, *the golden mean* is to be observed. Mr. Hanneman, of Brazil, says that his bees never suffer from dysentery, or rather that the disease never makes its appearance among them; because in that country, or at least in the favored region where he resides, there is scarcely a day in the year when the weather prevents them from flying.

[For the "American Bee Journal."]

Messrs. Editors of Bee Journal:—In answer to G. T., I would say, do not use any smoke, before or after opening a hive. First loosen the honey board carefully, then sprinkle the bees and frames with sweetened water. He can then handle them without a bee-hat; although, if he is timid, by wearing one he will soon get over it.

Any one after using the sweetened sprinkle, will never use smoke about a Langstroth hive again—although it was recommended in the last "Rural New Yorker."

Bees in the city have not got any pollen up to this date. Three miles south of this, they worked the first on the 13th of this month, but have done nothing since; and the way it is now snowing they will do nothing this week.

H. C. Spencer.

Oshkosh, Wis., April 17, 1861.

☞When a colony perishes of starvation in summer or in the fall, the workers first become too feeble to fly, and then too weak to walk, their motions being tottering and slow, till finally they die. If bees exhibit such symptoms in winter, they are not really dead immediately after becoming motionless, and may generally be restored, if found soon after getting into this condition and removed to a warm room. If their hive contain sufficient supplies of sealed honey, or they be transferred into one which is thus furnished, they may then still survive the winter.

The Bee.

Never has there been a creature, unless it be perhaps the sweet-toned nightingale, that has lent inspiration to the poet's muse more frequently than the little honey bee. And wherefor has she received such tributes of praise? Let us answer in the words of one of her admirers:

"Not a flower can be found in the fields,
Or a spot that we till for our pleasure,
From the largest to least, but it yields
The bee, never wearied, a treasure.

Scarce any she quits unexplored,
With a diligence truly exact;
Yet, steal what she may for her hoard,
Leaves evidence none of the fact.

Her lucrative task she pursues,
And pilfers with so much address,
That none of their odor they lose,
Nor charm by their beauty the less.

Not thus inoffensively preys
The canker-worm, in-dwelling foe!
His voracity not thus allays
The sparrow, the finch, or the crow.

The worm, more expensively fed,
The pride of the garden devours:
And birds pick the seed from the bed,
Still less to be spared than the flowers.

But she, with such delicate skill,
Her pillage so fits for our use,
That the chemist in vain with his still
Would labor the like to produce.

Then grudge not her temperate meals,
Nor a benefit blame as a theft,
Since, stole she not all that she steals,
Neither honey nor wax would be left."

Cowper.

Poets are often apt to exaggerate, but in the case of the bee we cannot lay this fault to their charge. There can be no doubt that this insect is, in every respect, one of the most interesting of all living creatures; and as the little denizen of the hive is the companion of man, and renders him essential service, it is but natural that it should receive a large share of his attention. This too must be *our* excuse for endeavoring to give fresh interest to the story that has already been narrated by so many able writers.—

Samuelson.

Mr. Kritz estimated that in a hive containing combs with 50,000 cells, 30,000 are appropriated for storing honey and pollen, and 20,000 for brood,

[For the "American Bee Journal."]

Bee Chambers.

There is no difficulty in making bees attach to the inside wall of a house. Have a box of a small convenient size, dressed smooth outside, rough inside; one side to slide, with a peg at each edge to hold it in place. This piece should be dressed smooth inside, to prevent the bees from attaching to it. When your bees swarm, put them in this box as you would in an ordinary hive. At night convey them to the house; turn the mouth of your box up, and confine it to the plate of the house, placing the side with the slide next to the wall. Draw out the pegs and let the slide down carefully, so that your bees can attach to the wall and plate. Have appropriate holes in the wall (from which side the slide has been removed,) for the bees to pass in and out. Keep this box there three or four days, until your bees get fairly at work. Then, at night, let it down two or three inches; and in a few nights more you may remove it entirely. If your house is dark they will work through the holes; if much open they will fly to the light.

Have your bee house of any size to suit your fancy. My first bee house in Selma, which has been in successful operation more than twenty years, is ten by twelve feet square and eight feet high over my dairy. The weather boards were put on after the manner of sealing, planed outside, inside rough. The bees are attached to the wall between the studs. They have worked down from the plate to within six inches of the floor, where they stop for the trash to fall, which is swept out once or twice a year, without further attention. No moth has disturbed them; and one colony has remained the whole time, as experiment, without taking away the comb. My present house, at the place where I now live, is fifteen feet square, eight feet high from plate to sill. This is made of upright planks with slats over the cracks outside. Between these slats are three 3¼ inch auger holes, first eighteen inches below the plate and at each eighteen inches down; all stopped, except the top, until they build down to them.—In this house, instead of studs to divide the families, are extended upright planks sixteen inches wide, to correspond with the plate, from plate to sill. After one swarm is attached, you may add to it as many more as you please, by turning the mouth of your hiving box up under the others, and knocking it gently, or smoking if they dont move. This may be done at any time, though I prefer night. Then by morning they are all quiet and at work. Bees are very partial to a house, and from it they never swarm; nor has there ever a swarm left my house, after they are put in.—You may send this to the new Bee Journal, to which I shall take pleasure in contributing some of my experiments, with my views of the origin and prevention of the bee moth, in either house or box, with as much certainty as you propagate the bee.

EDWARD GANTT.

Sylacauga, Alabama, April 24, 1861.

☞ It was customary, we believe, in some sections of Ohio, about "sixty years since," for the early settlers when erecting dwelling houses, to fit up a small room or chamber in the garret for the accommodation of bees, into which stocks were placed, alike for shelter and convenience. This arrangement appeared to be satisfactory both to the insects and their proprietors; and success induced various modifications and extensions of the plan—including fixtures for the attachment and support of combs built exterior to the original hive. Bees worked very well in such quarters; and probably some bee houses of this description may still be found in that and other Western States. But the irruption of the worse than Vandal moth, which took place about the year 1810, was followed by the gradual abandonment of this as well as most other modes of bee culture. The plan might be adopted with advantage for family purposes, if the ravages of the moth could be prevented; but for extensive operations it would not be well suited—except perhaps in a peculiarly favorable climate. Will Dr. Gantt oblige us with an account of his method of keeping the moth at bay?

[For the "Bee Journal."]

DESTRUCTION OF DRONE BROOD.

On the 9th of April I found, in a strong stock of Italian bees, a drone-comb full of eggs and larvæ. On the 22d this comb contained eggs and larvæ in about the same degree of forwardness. The weather, after the first examination, was wet and cold, but the bees were abundantly supplied with pollen and were regularly fed. Still they destroyed the drone-brood, and on the return of warmer weather began to raise more. A very much smaller stock, examined on the 22d, had drone-brood only a few days younger than the strong one. On the 1st of May, all their drone cells were filled with honey. The nights having been quite cool, the bees destroyed the drone-brood, leaving the worker-brood in the adjoining cells untouched. It is very difficult, even with strong stocks and careful feeding, to induce bees to raise drones much in advance of the season.

L. L. LANGSTROTH.

[From Samuelson's "Humble Creatures."]

THE BEE'S PLACE in the ANIMAL KINGDOM.

The division of the Class of Insects, by naturalists, into *sub-classes* and *orders* has been effected, first, by reference to the degree of metamorphosis which the group undergoes; and, secondly, to the absence or presence of wings, and, where these are present, to their number and character.

Thus, one group or sub-class that undergoes *no* apparent change, is called *A*metabola; a second, in which the metamorphosis, though perceptible, is not complete, is called *Hemi*metabola; and the third, or highest subdivision, in which there is a complete transition from the worm-like or larvæ state, first to the pupal or motionless stage, and next to the imago or perfect insect, when the actual metamorphosis is effected and the creature bursts forth from its tomb, fully fitted, both internally and externally, for its aerial existence, is called *Holo*metabola. And here we shall find our honey-bee, along with the beetle, the fly, and many other insects.

On examining the wings of the bee, we shall perceive them to be four in number; but this is not a sufficiently unique feature in its organization to enable us to determine the *order* to which it pertains: for there are several other orders, of widely different types, such as the Coleoptera (beetles), Lepidoptera (butterflies), &c., all of which possess two pairs of wings. We must look therefore at the character of the wings themselves, and shall find them to be of a firm parchment-like texture. Hence it is that the Order has received its name, *Hymenoptera*, from two Greek works, denoting the membranous structure of these organs. To this Order belongs not only the bee, but also the wasp, the ant, and some other insects, all remarkable for their highly developed instinct. These minor groups are termed *families;* and that which includes the bee is the family of the Apidæ, or true bees—the honey or hive bee being scientifically known as *Apis mellifica.*

The former designation (*Apis*) is that of its *genus*, and the latter (*mellifica*) of its *species;* but although its specific name is derived from a Latin word denoting its honey-making properties, it is not because it is the only species of bee that produces this delicious substance (for there are others possessing the same attribute), but it is because to *us* its hive-labors render it par excellence *the* honey bee. Once more, then, *Apis mellifica*, the honey bee, belongs to the *family Apidæ*, or true bees, included in the *Hymenopterous* (membranous-winged) *order* of the *class Insecta* or insects, and in that subdivision of the class known as *Metabola* or *Holometabola*, in consequence of the contained forms undergoing a complete metamorphosis; whilst (to complete our classification) the Insecta themselves occupy the highest rank as a *class* in that *province* of the Animal Kingdom known as the *Articulata* or Arthropoda (articulated feet), which are in their turn included in the great *sub-kingdom* of *Invertebrata*, or animals *not* possessed of an internal vertebrated skeleton.

Mr. Stochr, of Würzburg, says he has repeatedly seen young queens, in recently issued second swarms, pursue each other and engage in mortal combat; and he witnessed one case when both combatants perished in the struggle. A similar instance came under the notice of one of his friends. Usually, a strange queen which enters a hive, is dispatched by the workers, fecundated queens appearing to be instinctively anxious to avoid conflict with a rival. He infers that fertile queens are attacked or defended solely by the workers, and that the celebrated deadly duels take place only between rivals yet unfecundated—neither having then secured the attachment and allegiance of the workers.

Mr. Walter, in an article on wintering bees, asserts that colonies which have no stores of pollen, or are only meagerly supplied therewith, will not be injured, but rather benefitted, by being placed during winter in a dark depository with a moderate temperature. On the contrary, colonies well supplied with pollen, will be brought to the verge of ruin by being placed in such a depository, with the temperature considerably above the freezing point.

This may, perhaps, explain the discordant accounts beekeepers give of the results of experiments made in this mode of wintering bees.

Dr. Jähne says that if a field of buckwheat, in blossom, be situated near an apiary, and Linden trees are in bloom at the same time, at a somewhat greater distance, the bees will neglect and pass over the former to forage on the latter.—Buckwheat, as cultivated in this country, seldom blossoms at the same time with the Linden, so that opportunities for testing this are rare. Buckwheat, moreover, in some soils and seasons, fails to yield honey when in flower; and this may have been the case when Dr. Jähne made his observations.

☞Two natural swarms, hived on the same day, should not be placed near together in the apiary; and the same rule should govern in the disposing of newly made artificial colonies.

(From the "Bienenzeitung.")

Scouts, or the Fourier Bees.

Just before and during the swarming season, we may annually see bees entering and creeping about holes and crevices in old buildings, walls, and trees, apparently in search of something, passing in and out, flying off singly and returning, or hovering eagerly around the selected spot. At times the party is so numerous, and its behavior so orderly and regulated, that it requires a practical eye to decide at once that they are scouts, and not a newly issued swarm. When there happens to be no vacuum behind the crevice, into which they can enter, I have known them to cluster against the flat surface of the wall, covering somewhat densely a space six or eight inches long by two or three inches broad; but they were evidently restless and uneasy, unlike the outlying bees of an established stock. Such bees are usually regarded as belonging to some hive nearly ready to swarm, and as *scouts*, sent forth from it to select and prepare a residence for the coming colony.

I have seen them almost every year assembled thus on the turrets of an old castle, on the walls of my garden, and against the gable of my barn. The shallowness of the crevices about which they gathered, not furnishing room enough to accommodate even the smallest *cast*, and the fact that no swarm ever arrived after the most promising of these preparatory demonstrations, though natural swarms escaped almost every spring from my apiary, led me to doubt the correctness of the prevalent notion, that these bees were scouts. In the spring of 1844, I concluded to test the matter by careful experiments, and note the results. On the 12th of May, the first bees were observed at a crevice in the wall of my garden, and in the evening I directed my gardener to dust them well with pulverised chalk, while I stood in front of my apiary, to ascertain on their return, to which colony they belonged. I had not to wait long for their arrival; and the whole number entered hive No. 77, containing a very strong colony. Early next morning numbers were again seen on the wall, and so successively for four mornings. They were dusted with chalk every evening, and all returned to the hive just mentioned, as did also the bees of several small clusters on other parts of the wall. At about ten o'clock on the morning of the 17th, a powerful swarm issued from No. 77, passed off in the direction of the scout party, but clustered on a dwarf tree about twenty paces from the apiary, where it hung exposed to the direct rays of the sun. I suffered it to remain undisturbed though watching it closely. Shortly before eleven o'clock it rose, but quickly clustered again in a shady spot at a short distance, where it remained till three o'clock in the afternoon. It then started anew and passed rapidly over my summer pavilion into the open fields beyond the garden. My assistant followed afoot; and I mounted a horse in pursuit; but before I overtook him, the swarm had vanished from his sight, and we failed to get any account of its whereabouts afterwards. On our return we found the scouts still congregated on the wall, and when dusted in the evening, they returned to the aforesaid No. 77. On the 18th, they re-appeared there, as we supposed; but on dusting them at eve, they returned to No. 7—showing that these were of a different stock; not one of them went to No. 77. Early on the morning of the 19th, I had the crevice in the wall carefully closed with mortar, and placed a straw hive on a bottom-board, directly in front of it. When the bees arrived, they passed in the rear to the closed crevice, but soon returned and entered the hive—formally taking possession. I repeatedly lifted it slightly, but could only see that the bees were coursing about it, without making any efforts to cleanse it. In the afternoon of that day, hive No. 7 swarmed; and the bees, after trying two different places, finally clustered on a shaded limb of a linden tree—affording me a convenient opportunity to observe all its proceedings. Individual bees flew off in various directions (previously noting the place of departure in their usual manner), and some of them returned. The swarm remained clustered there all night. At early dawn next morning, I and my assistant resumed watch, having previously set the garden gates wide open, and put two horses, saddled and bridled, in readiness in the care of the hostler. At half-past five o'clock, I saw several bees suddenly leave, flying in a southerly direction, none of which returned. At half past seven, the entire swarm left, and followed in the same direction, flying low and slowly, a considerable number being plainly visible in advance of the main body. My assistant accompanied them on horseback, whilst I went afoot, easily keeping pace with the advance party, and satisfying myself that the swarm was moving steadily and confidently towards a pre-determined spot. When they passed out of the garden I mounted the other horse and joined my assistant in pursuit. We followed the swarm at a moderate trot about a mile, when, still flying low—not more than from four to nine feet from the ground in a southerly course—it rapidly increased its speed, compelling us to ride at full gallop to keep up with them. Arriving at the next village, distance some three miles, we saw the swarm pass into a cottager's

garden. I leaped my horse over the hedge, and reached the spot just as the swarm was entering the hollow stem of a pear tree. It entered so unhesitatingly and quickly, that I could not for a moment doubt that this receptacle had been selected before the swarm left my garden. In less than twenty minutes the workers began to carry out broken splinters and particles of rotten wood, and returned with pollen, &c.

I repeated this experiment four times in 1845, with partially different results. Three swarms actually entered and occupied the hives which had been placed in readiness for them and which were tenanted in advance by the scouts. But the fourth absconded, and after flying four or five miles entered a forest, where further pursuit was impracticable, on account of the dense underbrush. It was remarkable that in these six experiments, the three swarms, which took possession of the hives, had each settled only once, after issuing from the parent hive; whilst the other three had each removed several times from place to place, before finally leaving.

I subjoin succinctly the other observations made on these occasions.

1. The scouts never remained out over night, but left the holes and crevices gradually towards evening, and all had disappeared when the bees of the apiary ceased to fly.

2. They did not make their appearance in the morning, immediately when the bees in the apiary began to fly, but an hour or two later.

3. On cold or raw days, few scouts were seen, and occasionally none made their appearance.

4. When sudden showers or gusts of rain occurred, they hastened to their hive, like bees returning from the fields—though occasionally a few scattering ones remained, like bees surprised by stress of weather.

5. They made their first appearance at the approach of the swarming season, and generally disappeared before its close.

6. Dusting them with pulverized chalk enabled me to ascertain that all of them did not in every instance belong to the same hive. Sometimes there were individuals from three or four colonies gathered at one crevice. This, however, occurred only when several nearly adjacent crevices were frequented by bees. At isolated crevices, we always found bees from one colony only.

7. When bees from different colonies were assembled at the same crevice they frequently attacked each other; but I never saw any killed outright or fatally injured.

8. The bees invariably belonged to colonies nearly ready to swarm, though the scouts sometimes made their appearance ten or eleven days before the swarm issued.

9. I never saw a scout that carried pollen, nor were any drones ever seen among them.

10. They would sting only when violently enraged, as by breathing on them in the crevices; and even then it was a rare occurrence.

11. Their honey-bags contained very little honey—frequently none at all.

12. I could not ascertain whether any of them left to gather honey. I am inclined to believe that they did not leave for that purpose, but solely to keep up communication with the parent hive. When they were dusted with chalk at noon, I noticed only a few returning to the apiary.

13. There was no trace of combs nor any indication of preparation for comb-building perceptible in any of the holes or crevices.

What reliable inference may be deduced from these observations, as to the character and object of these scouts? Nothing more than that these bees are members of colonies nearly ready to swarm. Only this, and nothing more. Perhaps other apiarians will institute more diversified experiments, and throw light on this obscure and as yet mysterious point. BERLEPSCH.

(For the "Bee Journal.")

A WINTER PASSAGE.—Cheap and Permanent.

Some years ago Mr. W. W. Carey, of Coleraine, Mass., after cutting winter passages in the combs, put in them a coiled shaving, to prevent the bees from filling them up. I contrived a mode of *suspending* this shaving in an *empty* frame, so as to induce the bees to leave the passage open in building their combs. A thick shaving of any tough wood is coiled into a circle of about one inch in diameter and three-fourths of an inch wide, and a strip of tin about one-fourth of an inch wide at one end and one-eighth at the other, is pushed through this shaving where the ends lap together. With a small knife a slit is made on the under side of the top slat of the frame, into which the narrow end of the tin strip is pushed. The wide end projects a little below the shaving.

Unless a suitable winter passage is given to the bees, movable comb hives cannot be used to advantage in cold climates. L. L. LANGSTROTH.

Oxford, Ohio.

MR. OETTEL has observed that when a colony deprived of its queen undertakes to rear one from brood, they select larvæ already sufficiently advanced to form a perfect circle at the bottom of the cell, whenever they have brood of various ages from which to choose.

[For the "Bee Journal."]

I will illustrate my mode of dividing bees. Numbering my hives—**1, 2, 3, 4, 5,**—being all about equal in strength, I take from Nos. 1, 2, 3 and 4, two combs each, with eggs, larvæ, sealed bees, and honey, replacing them with empty frames, brushing back all the bees, and putting them into a new hive, No. 6. I place this where No. 5 stood, and remove No. 5 to a new stand when the bees are in full flight, so that the returning bees would enter the new hive, which would stand thus—**5, 1, 2, 3, 4, 6.** By this I would gain one strong stock, without materially reducing any one. If I have a spare queen cell to put into the new hive, so much the better. Within a few days I repeat the operation, and let the hive that has the fewest bees in flight remain untouched; always removing the extra queen cells, if any. In this manner I am able to keep my bees from swarming, and to secure the greatest yield of honey—always having an eye on the yield of blossoms to secure honey from. Whenever they appear to diminish, cease operations; as a small and sure increase is the greatest in the long run. This mode, I think, will also give me the greatest amount of increase, as I can commence earlier than I could if I divided only one at a time, and continue longer at it—as each new hive would have eight of the ten frames full of combs, and a few days producing honey would enable them to secure enough to winter safely. It is best to have an eye on the hive that is to be removed, that too many bees do not leave, and the brood be unprotected. In such case it would be best to change back. If it is convenient, it would be better to obtain bees from a distance, to supply the old stock removed, as recommended by Langstroth in his work, chapter on artificial swarming. I would recommend to new beginners in the business to commence with at least two stocks, even should it be necessary to sell in the fall, as by keeping the hives well filled they will thrive much faster, in proportion, than if one stock were divided into two parts. S. C. Brown.

Ravenna, Ohio.

☞Young queens which were unsuccessful in meeting drones, and have once commenced to lay drone-eggs, will not afterwards repeat their excursions. If a second swarm be put in a hive furnished fully and exclusively with worker-combs, a young queen may be confined to it for many weeks without beginning to lay drone-eggs. Nay, she may still become fertile, if permitted to fly, after a confinement so prolonged that it would seem to render such a result utterly hopeless.

CHOICE HONEY CROPS.

The movable comb hive is peculiarly adapted for the purpose of collecting and securing, in its pure state and unmixed with other kinds, the honey yielded by any particular species of tree or plant. For instance, where lindens, locusts, peach or other trees abound; or where white clover, mustard, lavender, sage, or similar plants are largely cultivated; it is only necessary, when any of these are in blossom, to insert frames with empty combs in the hive and remove them when filled. If the honey is intended for immediate use, it is not necessary to delay the removal till the cells are sealed over, and the contents can then be more readily drained out and the combs the more speedily re-inserted. But to secure this object completely and secure the largest amount of the particular kind of honey desired, there should be no unsealed brood in the hive during this period, as it would demand a large expenditure of time and attention on the part of the workers, and involve no inconsiderable consumption of honey. The queen should therefore be confined or removed five or six days prior to the intended operation; and released or restored after it is ended. The brooding chamber or proper dwelling place of the bees, should also be amply stored with common honey, so as to offer the workers no vacant spaces or empty cells; because they would instinctively fill their immediate quarters with stores, before carrying honey to the more remote parts of the hive. Hence, when any particular kind of pasturage abounds, and the brooding apartment is yet partially empty, it will be serviceable to take out the frames with empty combs, and insert combs of sealed honey instead—thus constraining the bees to carry their daily gatherings to the combs designed to receive them. When the apiarian has once thoroughly established the movable comb system in his apiary, he will almost always have on hand supplies of frames with sealed honey, and be prepared to effect the requisite arrangements. But if he is yet a new beginner, he should remember that full combs may be taken for this purpose from such common hives as are not intended to be wintered; or if he should subsequently conclude to preserve them, the honey may be restored after it has served this temporary purpose.

☞The vertical position of royal cells does not appear to be an indispensable requisite for the perfect development of queens; because queens have been reared in cells lying horizontally on the bottom board of a hive. The essential requisite seems to be a constant and abundant supply of royal jelly.

Fertile Workers.

In certain conditions of a colony, workers occasionally occur which lay eggs. In some cases, these eggs are few in number and irregularly placed; in others, they are numerous and deposited with nearly as much regularity as if they had been laid by a queen. These eggs will hatch; but they invariably produce drones. The facts have been known to apiarians for more than a century. In queenless colonies drone-brood has been found in innumerable instances, produced in constant succession, which, as no queen was present, and drones are males, could only have originated from eggs laid by workers. On stupefying the bees of such a colony by fumes of sulphur, and minutely inspecting each individual, the absence of the queen was placed beyond doubt; and on dissecting workers caught by Huber in the act of laying, Miss Jurine discovered that their oviducts contained eggs; and subsequent examinations have shown that these eggs resemble, in all respects, those laid by queens.

This singular phenomenon is, nevertheless, not so surprising as it, at first view, appears to be—since the workers and the queens are both produced from the same kind of egg. The queen, being a fully developed insect, has attained the ability of completely discharging her natural functions; whilst the worker is one whose development has been partially arrested, and is consequently not qualified to assume completely the position to which it might, under other circumstances, have been advanced. It is hence by no means surprising that we should find different degrees of retardation in different individuals; and that some workers should be met with which are somewhat more advanced than the generality—more nearly approaching in some respects the character of queens, and to some extent qualified to lay eggs.

Until recently, however, it seemed an inexplicable mystery that the eggs laid by such workers produced drones only—none ever producing a worker, much less a queen. But this is a mystery no longer. Physiological science has demonstrated that these egg-laying workers are insusceptible of fecundation; and it has, moreover, been clearly ascertained that all the eggs found in a hive, whether they were laid by a worker or a queen, produce drones only, if they were not impregnated by male sperm. It is, besides, now well known that these egg-laying workers are mere exceptions to the general rule, occurring only casually, and almost always only in queenless colonies. They are not consequently, as such, constituent or essential members of the community, in which nominally the queen lays all the eggs.

Generally only one worker qualified to lay eggs actually does so, when a colony becomes queenless, though there may be many more present. Berlepsch says that when he subdivided into three or four nucleii, a colony which had *recently* lost its queen, and in which eggs continued to be laid, oviposition was continued only in one of them. But when he subdivided, in like manner, a colony which *had long been queenless* and had been much reduced in numbers, eggs were laid in nearly all the nucleii.—Huber found twelve in one colony; and Berlepsch discovered twenty in a weak stock consisting of less than three hundred bees. The weaker a queenless colony is, the more the workers seem disposed to lay eggs, as though they no longer regarded themselves as members of a community, but as independent individuals—each separately and specially interested in the preservation of the race. They occur most frequently in colonies which have been queenless five or six weeks, and which do not possess the means of raising a queen; usually also in colonies which have sent out several swarms, and have finally become queenless; and in second swarms which lost their queens before they became fertile. They are rarely found in colonies which, though queenless, have the means of rearing one; yet eggs will sometimes be laid in such colonies before the young queen emerges from her cell.—Still more rarely are they found in colonies which have unfecundated queens; and most rarely of all, in the presence of a healthy fertile queen—as is evident from the fact that, on the removal of such a queen, egg-laying almost invariably ceases immediately. Still, freshly laid-eggs have been found within four days after the removal of a queen; and Dzierzon records one instance where a fertile worker laid eggs in a hive which contained a fertile queen. This was in a colony of Italian bees into which combs containing sealed brood of common bees had been introduced. The drones must have originated from eggs laid by a common worker, as they had just left their cells, and were still unable to fly.

If the hive contain drone-comb or drone-cells, fertile workers will lay in these, and resort to workers' cells only when no others are at hand. They will also lay in rudimentary royal cells; whereas drone-egg-laying queens will lay in worker-cells only—though Huber states that the latter will also lay in royal cells.

These fertile workers are not fecundated, and not susceptible of fecundation. On dissecting a number of them, Prof. Leuckart found in their ovaries from two to twelve ovarial tubes, contain-

ing eggs precisely similar in size and shape to those laid by a queen—each egg having a perfect mycropyle apparatus. But in each case, the spermatheca, like that of an ordinary worker, was merely rudimental, could only be seen by the aid of a microscope, and contained not the slightest trace of seminal matter. This proves conclusively their unfecundated condition; and that even if they were susceptible of fecundation, they do not possess any proper seminal receptacle, such as pertains to queens. Prof. Von Siebold, after dissecting some, also remarks,—"the eggs laid by a worker cannot be impregnated by her, because her spermatheca never becomes developed or enlarged, and the peculiar structure of the abdomen precludes intercourse with the male."

Huber found that some workers reared in cells, situated near a royal cell, were capable of laying eggs; and hence inferred that they may accidentally have received a portion of the royal jelly, whereby their sexual tendency became more strongly defined, though not fully developed.—Others have supposed that when a fertile queen suddenly dies, or is removed before royal cells have been started, the bees, in their eagerness to supply their loss, commence feeding a large number of worker larvæ with royal jelly, though they subsequently restrict their attention to a few only. Those which were thus temporarily made recipients of this bounty, it has been imagined, were proportionally more fully developed, and thence qualified to lay eggs. They *may* indeed, originate in either or in both of these modes; but these are certainly not the only ones—for fertile workers are sometimes found in colonies which have not for years raised queens, or even made any preparation for doing so. Berlepsch mentions a case strongly illustrating this. His finest Italian queen died in December, 1856. He had marked her in 1855, by clipping her wings, and was therefore certain that he had before him the identical bee; and he knew, moreover, from frequent examinations of the hive, that no queens had been reared by the colony, or attempted to be reared, since May, 1855. Yet he found drone-brood in the cells in February, 1857. Certainly not a bee then existing in the hive could have been bred in the vicinity of a royal cell, or by accident have received a portion of royal jelly while in its larvæ state. Consequently some workers must be able to qualify themselves to lay eggs, or become so qualified by the aid of others. Some may feel themselves sufficiently developed to be able to oviposite, or their companions may instinctly perceive that they are so developed, and treat them accordingly. If the workers can, by tendering or withholding supplies of nutriment, influence and regulate the queen's egg-laying, may they not exert a similar influence on such workers, when the condition of the colony is auspicious? Dr. Dönhoff fed a small queenless colony two weeks with a mixture of honey and white of eggs, and then sent eighteen of the bees to Prof. Leuckart for examination. On dissection, the oviducts of nearly all of them were found to be considerably enlarged, and in those of four of the younger bees eggs were distinctly visible. This shows that the oviducts of young bees especially are susceptible of some degree of development, by stimulating food; and as the royal jelly is a highly nitrogenous substance, it doubtless tends to give increased development to the oviducts of those workers to which it is administered, because they are regarded and treated as queens. It is thus by no means improbable that fertile workers are produced, in most instances, by being fed and treated by their companions in the same manner as queens are treated when increased prolificness on their part is desired by the community. And if the recipients of these extra attentions and specially stimulating supplies be still young, it is probable the object will be the more readily attained. This, too, would serve to account for the fact that colonies which have sent out swarms, if they become queenless soon after, and also second swarms in like predicament, so frequently contain fertile workers; whilst these so rarely occur in colonies which were safely wintered and lose their queens early in the spring, before drones have made their appearance. Yet it is remarkable that colonies which lose their queens in summer, never produce drone-brood, though they remain queenless two or three months.

These fertile workers are not all equally developed or equally qualified to lay eggs—some more nearly approximating to the character of queens, than others. This is evident from the different manner in which they supply the cells. Some lay with considerable regularity, supplying cell after cell, like a healthy, fertile queen; attaching the eggs properly to the bottom of the cells. Others proceed very irregularly—sometimes laying three or four eggs in one cell, and rarely attaching any of them properly to the bottom. Some are very prolific, and others lay comparatively few eggs. There seems also to be no external mark by which they can be distinguished from the common bees.—Berlepsch says, that in 1859 he had a drone-breeding colony, in which more than 4000 cells were supplied with eggs, with as much regularity as though they had been laid by a queen. He carried the hive to a close chamber, stupefied the bees, and inspected each individual minutely; but could detect no difference between them. Yet the

differences in the deportment of the colonies show that there must be corresponding differences in the character and qualifications of the pseudo-sovereigns. So long as the population is still numerous, it is in some cases exceeding difficult to ascertain the real condition of things without an actual inspection of the combs. The bees will fly as briskly, gather honey and pollen as freely, make as loud a humming at eve, and flare up as brusquely when their hive is struck, as though they really lacked nothing, while one of the most essential elements of prosperity is wanting. Yet, if worker-brood be introduced, they will neglect or refuse to rear a queen; if a sealed royal cell be inserted, they will reject or destroy the embryo; or if a fertile queen be offered to them, she will be summarily dispatched. In such a colony one sole fertile worker appears to officiate as queen, and is recognized in that character by the masses.

Others will begin to build royal cells, if worker-brood be given to them, but suddenly stop work and leave them unfinished; or if they proceed to finish and seal the cell, they will still perversely destroy the embryo before it reaches maturity.—Sometimes they accept and foster a sealed royal cell; but this is a very rare occurrence—their proceedings are so fitful and their whims so various, that the result is ever uncertain. They appear to be in doubt at times whether they have a queen or not; or the workers are divided into two factions, one of which delights in thwarting and counteracting the plans or projects of the other. Hence such a colony will at times accept an offered fertile queen, and retain her three or four days, yet finally dethrone and discard her. The most singular circumstance, however, is that if a queen thus temporarily retained, is very prolific and lays eggs freely before she is killed, the workers will proceed very methodically to rear a queen from her brood, and drone-egg-laying ceases as soon as the young queen becomes fertile. It has been conjectured that in such cases the queen retained for a time, is *always* killed by her jealous drone-egg-laying rival. This may indeed *generally* be so; but the bees themselves are certainly at times the rebellious party, as they have been observed suddenly to seize, envelope, and suffocate her.

Some colonies which have egg-laying workers, will readily accept an offered fertile queen, or rear one from worker-brood when placed at their command. These seem to be fully aware of their destitute condition, and anxious for speedy relief. If their hive be struck before a queen is offered, they respond promptly with their peculiar doleful moan of conscious queenlessness.

In some colonies, done-egg laying will be continued for weeks, after a fertile queen has been introduced and accepted—ceasing only gradually at last. These are generally such as contain a considerable number of fertile workers, none of which regards herself or any of her companions as of regal dignity, and all of which are hence prepared and disposed to renew their fealty to the true blood royal. Dr. Dönhoff once caught a bee of such a colony, as she was returning to her hive laden with pollen, and on dissection found eggs in her oviducts—warranting the conclusion that fertile workers were unusually numerous in that hive.

Attempts will be occasionally made in some such colonies to raise queens from drone-brood. But the embryo never reaches maturity—always perishing in its pupa state; probably, because royal jelly is not the proper sustenance for drone larvæ. In such cases the colony is certainly conscious of its queenless condition, as even these abortive efforts to apply a remedy clearly indicate.

Occasionally also, a colony which has neither queen nor brood, rejects an offered fertile queen, because the fertile worker to which it has been accustomed to do homage, though she has now lost her ability to lay eggs, is still acknowledged and treated as a queen. Bees may likewise, from some cause or for some reason, be induced to regard a common worker as their queen, though she never lays an egg. Dzierzon once had a queenless colony, *in which no* drone-eggs were laid; and yet it killed in succession three fertile queens which he introduced. Finally, when the population had become greatly reduced, he examined the bees thoroughly, and found among the number one which was manifestly very old, attended by a cortege of workers, and treated like a queen. He removed and killed her, and the colony soon displayed all the uneasiness, restlessness and distress usually exhibited by one whose queen has been lost or removed. He then offered them a fertile queen which was promptly and joyfully accepted. Dzierzon supposed that the pseudo-queen, though incapable of laying eggs, may have been able to emit sounds somewhat similar to those which queens occasionally utter, and which so powerfully affect the workers; and that she thereby induced her companions to regard and treat her as their sovereign.

It is singular that this faculty of laying eggs, which is certainly not possessed by all workers, is so common among wasps, humble bees and ants, that very few workers belonging to these classes can be found which are not so endowed.

☞ The Favignanese beekeepers regard the want of pollen at the approach of spring, as one of the chief causes of dysentery among bees.

[From Samuelson's "Humble Creatures."]

Development of the Bee.

In the first stage of its existence, that is to say the larvæ state, after it has proceeded from the egg, the young bee resembles a minute, yellowish-white worm, exhibiting to the naked eye no trace of external organs or members. The lens, however, reveals an imperfect oral apparatus or mouth, for the reception of food (administered to it by the workers whilst it still remains in the cell), and on the lower lip a pair of spinnarets, with which it spins its cocoon preparatory to assuming the second or pupa state.

The body of the larvæ is divided into thirteen rings, and a row of spiracles or breathing holes may be detected on either side of the body, one situated upon each ring.

It is, however, not a very attractive object, having the appearance of a great over-fed maggot, and the wonder is that from such an imperfect and ungainly form there should, in the course of a few days, be developed the perfect little bee, with all its organs and members; eyes, simple and compound; wings, legs, and all the other portions of its external organization.

In the metamorphosis from larvæ to pupa, a constriction takes place between the first and second, and another between the fourth and fifth rings of the body; the first becoming transformed into the head, with its antennæ, oral apparatus, &c.; and the second, third, and fourth into the thorax with its accompanying members; whilst the remaining rings constitute the abdomen. The large compound eyes at first resemble two small dark streaks, one on each side of the head, and even at this early stage their composite structure is discernable under the microscope. The various members of locomotion do not grow out of the body, but appear upon the surface, moulded, as it were, under the manipulations of the invisible hand of nature.

At first they remain adherent to the body throughout their whole length; but as the metamorphosis proceeds they become detached, and at length the yellowish pupa (for it retains the characteristic color of the larvæ for some time after the change has begun) assumes a dark-brown hue, the external skin becoming hardened.—Simultaneously with these external changes in the bee's structure, a transformation is taking place in its internal anatomy. This, in the larva, is of the simplest kind, being adapted to the habits of the insect, and ministering to its rapid growth.

The digestive organs are the most prominent, but even these consist chiefly of a large intestine, and they do their work so efficiently, that an immense quantity of fat is stored up in the body of the little larva as raw material, of which the more complicated organs of the imago or perfect insect are built up.

But, quitting the consideration of the mysterious changes that are veiled from our sight, we shall direct our attention to the active operations of the workers in connection with this part of the bee's history.

The poor worm usually lies curled up in a half circle in its cell, and the only symptom of life that it exhibits is by scratching with its mandibles against the cell-wall, as an intimation that it requires nourishment. It, however, becomes the tenderest object of solicitude on the part of the workers, which constantly supply it with infant food prepared from honey and pollen, and offered to the little nursling at the point of their ligula or tongue. The whole arrangement of the attendance resembles that in a foundling hospital. The watchful nurses pass from crib to crib, from cell to cell, offering food to the little inmates, stroking them with their antennæ, and fondling them with their delicate organs of nutrition.

After they have been thus treated for a few days, the nurses discontinue the supply of food, and close up the orifice of the cell with wax. This operation they perform by appying a series of concentric rings of gradually decreasing circumference, one within another, until there is nothing left but a small hole in the centre, which is then blocked up with a particle of wax. As soon as the cell is closed, the inmate sets to work and spins a cocoon of silk (which the *queen*-larva accomplishes in about twenty-four hours, and the *worker* in thirty-six), and then rests for two or three days. At the end of this time it assumes the *pupa*-form, undergoing the metamorphosis from the worm-structure to that of the insect; and when this is complete, the *imago* or fully developed insect, first frees itself from its silken envelope, and then, forcing open the lid of its prison-house by means of its head and mandibles, makes its escape, a perfect bee.

The time occupied from the deposition of the egg to the final appearance of the insect is, for the queen sixteen days, for the worker about twenty, and for the drone twenty-four days.

But the labors of the worker in regard to the tending of the brood do not end here. After the young insect, be it worker or drone, has effected its escape, a number of busy nurses at once set to work and prepare the vacated cell for the reception of another egg. First, one enters, and searching for the pupa-case, drags it forth and carries it away to the entrance of the hive; a second follows and brings away the exuviæ of the larva; and then other succeeding bees clear off every particle of refuse; leaving only a portion of the silken cocoon, which gives additional strength to the cell.

(From the "Country Gentleman.")

L. L. LANGSTROTH'S PATENT BEE HIVE.

EDS. CO. GENT.—I wish through your columns to make some statements to the beekeeping public respecting my patent hive.

When I applied for this patent, I was not aware that movable comb hives had ever been used, except those with movable bars or the sectional frames of Huber. The former required the combs to be cut from their side attachments, while the latter were so costly and demanded so much experience, time and patience to open and close the sections, that notwithstanding they were invented at the close of the last century, they were confined almost exclusively to amateur beekeepers.

In the first and all the subsequent editions of my work on the Hive and Honey Bee, I have given the plan of the Huber "leaf hive," and while describing its defects, I never attempted to conceal my obligations to this "Prince of Apiarians." Speaking of him I say: "Very early in my apiarian studies, I constructed a hive on the plan of the celebrated Huber; and by verifying some of his most valuable discoveries, became convinced that the prejudices against him were entirely unfounded." And again—"The use of the Huber hive had satisfied me that with proper precautions the combs might be removed without enraging the bees, and that those insects are capable of being tamed to a surprising degree. Without a knowledge of these facts, I should have regarded a hive permitting the removal of the combs, as quite too dangerous for practical use."

In the first edition of my work published in 1853, I say: "If Huber had only contrived a plan for suspending his frames, instead of folding them together like the leaves of a book, I believe that the cause of apiarian science would have been fifty years in advance of what it now is."

Now if I had known that my hive was not so much better than Huber's as to deserve a patent, and if I had been base enough to attempt to palm upon the public substantially his invention as my own, can any man of common sense believe that I would have published to the world, just where and how I *stole* my pretended invention? And yet this is substantially what I have been charged with doing.

Since my application for a patent, I have ascertained that prior to my invention other movable frames, besides those of Huber, were in use in Europe. None of them, as far as I can learn after thorough inquiry, are any better than those of Huber. I would refer those who desire information on this point, to the *Cours Pratique D'Apiculteur* of M. Hamet, published in Paris in 1859, which contains a larger variety of cuts and descriptions of hives than can be found, I believe, in any other work. All the modifications of the Huber hive are pronounced by Hamet to be useful only for purposes of observation, and he asserts that in the districts of France, where beekeeping is most largely pursued, no movable frame hives here ever come into general use—and that the removal of the frames from the best of them is often more difficult than from the Huber hive. He closes his account of these hives with the significant remark, that "in a moment of enthusiasm he once supposed that such a hive might be cheaply made, but that he had tried in vain."

Now compare these results in France, with the extensive use, by the best practical beekeepers in this country, of the movable comb principle, and the inference will be almost irresistible that they have not *yet* invented a cheap and practical way of using movable frames.

In the Beekeeper's Convention in Cleveland, last March, an article was read from a recent English publication, in which all hives with movable frames are declared to have no practical value. Of all the movable frame hives now in use on the Continent of Europe, the Berlepsch hive is probably the best—(for a description of this hive, see American Bee Journal for Jan.) It was invented subsequently to mine, and uses essential features covered by my patent, without which this German hive would have no more practical utility than those which have so signally failed.

Allow me to give an extract, in this connection, from a letter received by me last fall from the Baron Evon Linsingen of Oznaborick, Kingdom of Hanover, dated 10th of August, 1860—"I feel convinced that no other apiarian has been able to construct a movable comb bee hive in such an advantageous way as you have done. On the 20th of September, the apiarians from all parts of Germany assemble in Hanover to have a grand consultation about the hive and honey bee, and I wish you to send to my address two of your hives."

The order came too late to be filled in season for the convention. Were I to attempt to show in what particulars the various patents* in this country, using movable frames, have appropriated to a greater or less extent the essential and patented features of my invention, I should require more space than in the largest liberality you would be willing to give, besides opening a personal controversy in which comparatively few of your readers would feel any interest. This much, however, I wish to say, that in my opinion all of them use some of these features, and that without this use they would be of no more practical value than the European hives. I believe that the courts of law will sustain this opinion, and I should, long before this, have sought their protection, but for my limited pecuniary resources, the state of my health which has caused the loss of more than half of my time for the last nine years, and the fact that other parties own the greater part of my patent. I have never sought for more than my rights, and if any one can show that before my invention there existed any movable frame hive adapted to practical use, or any invention that used the essential and patented features of mine, I will try to be the first to acknowledge that although an *original* inventor, I was not the *first* inventor of such a hive. L. L. LANGSTROTH.

Oxford, Butler Co., O., April 10, 1861.

*Mr Baldridge is entirely misinformed in supposing that there is no patent on the Harbison hive. It was patented in 1859.

(From the "Bienenzeitung.")

RAISING QUEENS.

If after depriving a colony of its queen, a horizontal cut be made through a brood-comb containing eggs and young larvæ, and the upper section which remains attached to the top slat of the frame, be re-inserted in the hive, the bees will construct royal cells and raise queens from the larvæ on the fresh-cut margin of the comb, even if no royal jelly be used to designate the place where royal cells are desired. This process invariably succeeds if the comb be placed in close proximity to the brood in the hive, and the bees be numerous enough to cover the brood-combs properly. If two or three days after, when royal cells have been partially built, another comb with eggs and young larvæ be prepared in like manner and inserted, royal cells will be started on this likewise, and the queens reared therein will mature several days later than those on the former comb. This process may be extended with like success to the insertion of a third or a fourth cut comb, and successive rearings of queens thus secured. The apiarian must, however, be careful to remove and use these royal cells before the inmate of any one of them matures and emerges, or the destruction of the others would certainly follow. By seasonably rearing queens in this manner and placing them, or the royal cells containing them, in small boxes furnished with maturing worker-brood and a few hundred bees, the apiarian may readily multiply queens from a single hive, without interfering with the labors of other stocks; and the population of the hive used for this purpose may easily be kept up, by inserting from time to time, a few combs containing maturing worker-brood taken from other colonies. OBED.

[For the "Bee Journal."]

SLOW DEVELOPMENT OF A QUEEN BEE.

On the 25th of April I made a nucleus for rearing Italian queens. On the 27th they had five queen-cells. After these cells were closed, I noticed another queen-cell just begun. The first queen hatched on the 9th of May. The queen-cell last formed was given to another stock, and the queen did not hatch until the 16th of May. I examined from time to time, so as to be certain that she was not confined in her cell by the bees. She was therefore *twenty-one days* in coming to maturity.

L. L. LANGSTROTH.

DZIERZON watched a queen bee when laying, and noticed that she layed eighteen worker-eggs in three minutes. She appeared to dispatch business still more expeditiously when laying drone-eggs.

AMERICAN BEE JOURNAL.

Philadelphia, June, 1861.

THE BEE JOURNAL AND THE TIMES.

The present unhappy condition of our country has had a depressing effect upon almost every department of business, and upon none more than that of publishing. The minds of the people are so intently directed to the war news, that reading of almost every other kind, is for the time being, thrown aside. We have no desire to repress this feeling of interest in a matter so deeply affecting our national welfare, and yet we would not have our beekeeping friends forget us. Until the breaking out of the war, we had every thing to encourage us, and the prospects of the BEE JOURNAL were so highly flattering, that its complete success appeared to have been removed beyond the peradventure of a doubt. We have still abundant sources of encouragement, and have no doubt that we shall be able to establish it upon a sure and permanent foundation, despite the difficulties which have surrounded it almost ever since it has had existence. It is our determination to leave nothing undone that will merit success, feeling assured that the Beekeepers of the United States will, notwithstanding our national troubles, give us their earnest and hearty support. Our thanks are due a large number of friends who have given us the benefit of their pens and personal influence. We feel deeply grateful for those acts of disinterested kindness, and hope they will be continued.

The BEE JOURNAL *will not*, whatever the present national difficulties, be suspended. We indulge the hope, that the war now raging will soon be terminated, and that peace and prosperity will again reign absolute throughout the country. If these golden anticipations are verified, we desire that the AMERICAN BEE JOURNAL, like the AMERICAN FLAG, may be sustained. There is but one AMERICAN FLAG and but one AMERICAN BEE JOURNAL. As every good citizen rallies round, defends and supports the former, so should every good American Beekeeper give his aid and influence to the latter.

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Monthly Management.

JUNE.

This month usually furnishes the bees with most ample supplies of honey, and if the weather prove favorable to their labors and the colonies be strong and healthy, the hives will be rapidly replenished with stores. Early in the month the white clover, the linden and the locust trees come into blossom; and various other cultivated plants, as well as wild flowers, yield seemingly inexhaustible supplies. The days are long, the nights are warm, and the active little laborers are thus incited to untiring exertion. In most districts swarming now begins; and the swarms now issuing are frequently more valuable even than those obtained in May—being stronger, and coming when pasturage is more abundant.

The unremitted attention of the beekeeper is now demanded. If his bees are in common hives, and the stocks are populous, they will require watching daily from about nine o'clock in the morning till after three o'clock in the afternoon; unless he concludes to drive out a swarm from each that is in a suitable condition for such an operation—thus saving time, avoiding protracted anxiety, and obviating risk of loss from the escape of swarms. Hives for the accommodation of young stock should be previously provided, and every needful arrangement made in advance for the prompt and proper disposal of natural or artificial swarms. All this is the more important when the apiarian has in charge a large number of stocks, in good condition, and many of which are likely to be ready to swarm at nearly the same time.

Driving should rarely be undertaken until the colonies are strong, and the bees cluster out over night; but when that is the case, it may be resorted to with decided advantage. It may now also be usually adopted in the case of colonies in common hives which have much old comb or an old queen. A young and fertile queen should be substituted for the old one in the driven swarm; and in about three weeks, when all the brood in the old hive has emerged, the unserviceable combs in it may be removed, and the workers allowed to construct new in its stead. Should the season, however, be unfavorable, they will be greatly assisted if a supply of empty combs, in good order, can be given to them at intervals.

Dividing stocks, and thus forming artificial colonies, can be conveniently practiced only where movable comb hives are employed. It is a highly interesting mode of multiplying stock; and, apart from its practical utility, affords the apiarian the best possible opportunity to apply and increase his theoretical knowledge. Reading and study will not alone suffice; experience and experiment are needed in addition, to make him a skilful and successful operator, and inspire him with confidence in his own resources.

Many persons regard the division of a colony as so formidable an undertaking, that they engage in it with reluctance at first, even when convinced of the advantage attending or resulting from it. And not a few, after placing swarms in movable comb hives, never venture to use the means thus at command for improving their bee culture. The old-fashioned *gums* are the very best *invention* which such beekeepers could use, and they should never think of introducing any other on their premises. To be of service, the movable comb hive must be used intelligently *as such*—as the efficient means of practically executing what science and theory teach, and season or occasion require.

But there is great danger also that this business of dividing may be *overdone*, by new beginners who have just learned to operate with facility and confidence. The ease with which colonies may thus be multiplied, leads them into temptation; and they go on dividing and subdividing, in season and out of season, till in the end they have neither *quotient* nor *remainder* left. These act on the other extreme; but if they have good sense enough to perceive that the fault is in *themselves*, and *not in the system*, they will speedily be cured of this propensity to grow rich too fast, and content themselves in future with moderate and seasonable, and therefore certain increase. Beginners should ever bear in mind that they are still *learners*, and must calculate on having to pay a tuition fee, in some form or other, before they secure a diploma.

If the weather continues fine and pasturage abundant, so that the bees can gather honey abundantly, they may soon be in want of storage room; and access to some of the surplus honey boxes should be given, even though there be still some vacant space in the brooding apartment of the hive. Bees are at such times more disposed to take possession of surplus boxes, than at a later period, when from diminished supplies, their ardor is somewhat abated.

The later in the season a swarm issues or an artificial colony is made, the stronger it should be, or the more it should be aided, to get in a condition to pass the ensuing winter safely. If a full supply of well-preserved empty combs can be given to such, it will save them much labor and enable them to reserve for future use the honey they may still be able to gather. Combs, in which brood has been reared, may at times be procured from old colonies, and is preferable to new for the use of late swarms or made colonies, because it retains heat better, and thus facilitates successful wintering.

Feeding young swarms for some time after having them, is always beneficial; but especially so in seasons when pasturage is less abundant than usual, or the weather uncommonly dry. It incites them to prosecute comb-building vigorously, so as to make efficient progress in the work, before the daily reduction of their numbers causes them to relax their labor and devolve the task on the new brood of workers, which will probably emerge too late to render much service. The honey offered on such occasions should be greatly diluted, in order to encourage them to the utmost in comb-building, and keep them engaged at it, till their hive is adequately furnished. They should likewise be induced rather to build a small number of full-length combs, than many stout ones; as the latter are ill adapted, in any way, to constitute the winter quarters of the colony.